THURSDAY, OCTOBER 23, 1890.

BRITISH FARM, FOREST, ORCHARD, AND GARDEN PESTS.

British Farm, Forest, Orchard, and Garden Pests. A Manual of Injurious Insects, with Methods of Prevention and Remedy for their Attacks to Food Crops, Forest Trees, and Fruit, to which is appended a Short Introduction to Entomology. Compiled by Eleanor E. Ormerod, F.R.Met.Soc., &c. Second Edition. (London: Simpkin, Marshall, Hamilton, Kent, & Co., 1890.)

THE first edition of "The Manual of Injurious Insects" was published in 1881, and was then justly considered by all entomologists to be the most important work upon economic entomology since Kirby and Spence wrote their famous "Introduction to Entomology," "combining," as John Curtis said, "truth, instruction, and amusement." It was undoubtedly also by far the most exhaustive account of insects destructive to agricultural and horticultural crops that had been produced since the appearance of the admirable "Farm Insects" of Curtis in 1860. The second edition of this useful "Manual of Injurious Insects" has been recently issued, and contains in addition to the vast stores of information concerning all manner of insects which attack farm and garden crops, the results of the devoted labours, keen research, and scientific observation of Miss Ormerod, during a period of nine years.

In point of volume and matter this last edition is nearly twice as large as the first. As regards interest, practical value, and science, it is likewise of much more importance, because it records the discovery of insects altogether new and undescribed in this country, as well as measures of prevention and remedial methods against these and many other insects, that have been prescribed and adopted within the past decade. It describes, in short, the advance which has been made in economic entomology in this period, in the knowledge of insects, of their life histories, and habits, and of means to protect the crops of cultivators against their ravages. And no one is better qualified to relate this progress than Miss Ormerod, who has herself contributed so greatly towards it.

Most of this new matter has been previously given for the edification of the public and the advantage of farmers in Miss Ormerod's "Annual Reports of Observations of Injurious Insects and Common Farm Pests." It is condensed in the new manual, and arranged under different headings, or parts. These are three, the same as in the first edition. Part I.—Food crops and insects that injure them. Part II.—Forest trees and insects that injure them. Part III.—Fruit crops and insects that injure them.

An Introduction to Entomology is given in this edition as an Appendix, while in the former it precedes the three parts, or divisions. It may be said of this, in passing, that it will be most useful to students of entomology, as it gives in concise terms the main points by which insects of various orders and species may be distinguished in each stage of their life histories. The classification of insects is plainly set forth so that beginners may see almost at a glance the primary division of insects into the two great tribes, *Mandibulata* and *Haustellata*, and the subdivision of the one into eight orders, and of the other into five orders, in accordance with the rational arrangement of Prof. Westwood.

Among the troublesome insects treated of in Part I. are several species of butterflies, moths, and flies which attack cabbages, as the large and small white cabbage butterfly, *Pieris brassicæ* and *Pieris rapæ*, the cabbage moth *Mamestra brassicæ*, the cabbage fly *anthomyia brassicæ*, and others more or less injurious to the brassica tribe. Complete histories are furnished of all these insects, and valuable means of prevention are advised and remedies suggested of a practical nature that can easily be adopted, both on a large scale suitable for farmers and market gardeners, as well as for gardeners and allotment holders.

There is an important monograph of the carrot-fly, *Psila rosæ*, which will be gratefully received by market gardeners and market garden farmers, as the fly has in the last few years been especially destructive, not only in England, but also in Scotland and Ireland. This attack is generally termed "rust," because the leaves of the carrots become yellowish, or rusty coloured, and the roots are covered with rusty patches. To one unacquainted with entomology and not having good eyesight, it is difficult to trace the cause of the disorder to the tiny maggots of this fly in the roots of the plants. Upon very careful examination, however, a diseased carrot will be found to be swarming with legless, slimy, yellowish maggots, not a quarter of an inch in length, many of which are found to be sticking half in and half out of the roots. Miss Ormerod says:—"The grubs may be found in winter as well as summer, and attack all parts of the carrot-root by gnawing galleries on the surface, or into the substance of the root; but whilst the roots are young, the grub appears generally to attack the lowest part." This is not always the case, for in some young carrots examined in July last, which were sent from Ireland, the crowns of the roots were as full of the maggots as the ends.

Under the head of prevention and remedies for this affection, it is stated—

> "The following notes regarding carrot cultivation will be found to bear in various ways suitable to different circumstances of soil and climate on the main points of —1st, such preparation of the ground in autumn, or winter, as will ensure favourable conditions for a healthy, vigorous, and uninterrupted growth from the first sprouting of the seed; 2nd, thinning at such a stage of growth, in such circumstances of damp weather or with such watering or treatment after thinning as may least expose the plants to the attack of the carrot-fly which frequently occurs after this operation. Whether the fly is attracted by the scent of the bruised plants, or what brings it, is not clear, but it is very clear that, as it goes down into the ground to lay its eggs on or by the carrots, all operations which leave the soil unusually loose and open lay at the same time the carrot roots open to attack, and it will be observed that the various methods of treatment in regard to thinning bear upon the means of meeting this difficulty."

This is given as one instance of Miss Ormerod's powers of observation as to the habits of insects, which enable her to recommend suitable and effective remedies and methods against them. The practical conclusion in this case is that carrot-growers should thin carrot plants early, and draw the soil as close as possible, and make the soil very firm around them immediately after thinning has taken place.

Again, "although the summer broods hatch in three or four weeks the maggots may be found in the roots during the winter, and they change to pupæ in the earth adjacent. It is therefore very desirable that all infested carrot-beds should be thoroughly cleared of roots in the autumn, and the ground well dug, or trenched, so that such maggots or pupæ as remain in the bed may be destroyed; some may escape, but the larger number will thus be buried too deeply to come up again or be thrown on the surface to the birds; and a dressing of gas-lime will be serviceable in destroying such of the maggots as are lying near the surface."

Remedies are prescribed for this attack in the shape of dressings with spirits of tar mixed with sand, and of paraffin oil and sand; also waterings with dilute soluble phenyl and paraffin oil, in the proportion of a pint of paraffin to two gallons of water.

Among the many insects that injure corn crops whose histories appear in this "Manual," is a group of flies, among which are the frit fly (*Oscinis frit*)—a minute fly, not the eighth of an inch long, whose attention seems to be confined to oats. The maggot coming from the egg laid by this "fly feeds in the heart of the young oat-plant a little above the ground-level and eats away the centre, so that the shoot above the eaten part is destroyed, and the damage that is going forward then becomes noticeable from the injured shoots turning brown and withering instead of continuing their growth."

The frit fly has been well known in France, Germany, and particularly in Sweden, where it attacks barley, but until 1888, when the attacks of the frit fly were very prevalent in Devon and Cornwall, not much was known of it in this country, although, as Miss Ormerod points out, "the presence of the *Oscinis vastator*, Curtis, which appears to be the same as *Oscinis frit*, was watched and recorded in 1844 by John Curtis in his 'Farm Insects.' In 1881 I was favoured by Mr. R. H. Meade, of Bradford, with the information that the *Oscinis frit* had been observed in the autumn of that year in swarms in an outbuilding, in the lofts of which a lot of newly-threshed barley had been stored, which points to the Swedish form being then present; but it was not until 1887 that I was able to watch this attack throughout its course, up to the development of this fly as a regular field attack."

Farmers now find another fly, the "gout" fly, or ribbon-footed fly, *Chlorops tæniopus*, to be a frequent enemy to wheat, rye, and barley plants. This, as shown in the "Manual," is most prevalent on barley, and is mentioned by Curtis as having done much harm, in 1841, in Surrey and Lancashire. Now it is found in most parts of the country, and is a striking instance of the general spread of insect pests within the last few years among cultivated crops of all kinds.

The action of this insect is thus described by Miss Ormerod:—"Whilst the plant is still young and the forming ear is wrapped in the sheathing leaves, the fly places her eggs either within these leaves or so that the maggot can make its way through them to the ear; there it usually eats away some parts of the lower portions of the ear, and then gnaws or, rather, tears a channel down one side of the stem to the uppermost knot, and beneath the leaves the maggot changes to a reddish chrysalis, from which the gout fly appears about harvest time."

It has been a moot point where this insect passed the winter in this country. In Germany, as Taschenberg states in his Praktische Insekten Kunde, the flies place their eggs on grasses and autumn sown corn, upon which hibernation takes place either in larval or pupal form. As reported by the Consulting Entomologist of the Royal Agricultural Society of England, pupæ of the chlorops were discovered in the main stems of wheat plants just above the ground, in England, in the early part of the spring of 1890 by Mr. Whitehead. The time when these were found and the evident injury caused to the plants proved that the insect had hibernated within their stems.

Another insect belonging to the group of corn flies is the corn saw fly, *Cephus pygmæus*, a very small insect which pierces the stem of wheat and barley plants "just below, or at one of the knots, and inserts there an egg, continuing this process successively to other stems until her egg supply is exhausted. The maggot, which hatches in about ten days, is about half an inch long, yellowish white, fleshy, with a horny, rusty-coloured head, and is peculiar in being footless, although the larva of a saw fly. It feeds on the inner substances, clearing its way sometimes through the knots, even through the topmost, and when nearly full-grown comes down inside the stalk on which it has fed; and about harvest time, or a little before, it comes down to the ground level, where it gnaws a ring so neatly and cleanly round inside the stem that the straw readily falls with its own weight, or from a slight pressure of the wind, the severed stalk showing almost as smooth a fracture as if it had been separated by a knife. When the maggot has thus travelled down the stalk and nearly cut it through (so that nothing may prevent its escape presently as a fly) it goes down into the lowest part and spins itself a silken case in which it passes the winter."

The wheat-bulb fly (*Hylemia coarctata*), though only identified in 1882, has now become one of the pests to be dreaded by wheat growers. Curtis does not speak of it, and it was first distinguished in this country by Miss Ormerod. Taschenberg speaks of this fly as destructive in parts of Germany, and says there are two broods there. As this seems to be a new destroyer here, it is possible that it was brought from Germany with imported straw or produce of some kind.

In the "Manual" it is observed that the attacks of the maggots of the wheat-bulb fly and those of the frit fly are much alike, so far as the method of injury is concerned. But here Miss Ormerod's entomological knowledge and acute perception of the smallest distinctions serve to show how the different flies may be recognized. In the maggot or larva of the wheat-bulb fly "the tail segment projects, and ends in two squarish-ended teeth with flattened edges placed centrally, with one pointed tooth, and sometimes more, on the central square part. . . . The presence of these teeth and the *absence of* a little bunch of stalked spiracles near the head appear to me to be the simplest way of knowing the wheat-bulb from the frit maggots."

The Hessian fly, another member of the group of stem flies, having first appeared in Great Britain in 1886, is graphically described by Miss Ormerod, who has done so much to familiarize agriculturists with the dreaded scourge, and to make them acquainted with preventive measures and remedies against it. This information, published from time to time, is concisely summarized, so that it may be said that, in the few pages devoted to this insect, all that is known about it is plainly set forth.

The least generally known facts connected with the Hessian fly, and those of the most scientific interest, relate to its parasites, which have been carefully studied by the authoress, who had the advantage of long consultations with Prof. Riley in 1887.

The importance of the various parasites of the Hessian fly in tending to keep it down in this country is great. By some it is believed to be desirable to rear them and take them to places that are badly infested, just as, recently, parasites were imported from Australia to destroy the *Icerya purchasi* in the Californian orange groves. It is certain that in this last summer the attack of the Hessian fly was immensely modified by the parasites, which were present in unusual numbers. In several instances where the pupæ of the Hessian fly were transferred to live cages, at least 70 per cent. proved to be parasitized by at least three different kinds of flies. Miss Ormerod and Prof. Riley agree that the parasites of the Hessian fly in Great Britain are of the same species as those found in Russia, and differ from those which infest the Hessian fly in America. Comparative lists of the American and Russian Pteromali are submitted, from which it is seen that they are of the same genus, but not of identical species. "The examination of our parasites," Miss Ormerod concludes, "pointed, therefore, very strongly to the probability of our Hessian fly attack having been imported to us from the east of Europe." And, further, it is suggested that it originated, not in straw imports, as it was first imagined, but in the pupa, or "flax-seed," condition in foul grain imports.

In Part II., devoted to the insects that injure forest-trees, among the principal offenders is shown to be the elm-bark beetle, *Scolytus destructor*, which makes the well known galleries between the bark and the wood, "mainly in the soft inner bark, but so as to leave a slight trace of the working on the surface of the tree." This beetle often causes serious injury to elms both in this country and on the Continent. It generally attacks trees, or the parts of trees that are inclined to disorder, or decay, or that have been previously attacked by beetles. To circumvent the operations of this insect, Miss Ormerod recommends that the rough bark should be scraped off, so that the larvæ are exposed to air, or driven out by the flow of sap from the inner lining of the bark. This was found to answer in France, where upwards of 2,000 trees were thus treated.

The ash-bark beetle, *Hylesinus fraxini*, injures ash trees in the same manner by making galleries beneath the bark, particularly in young trees. It is advised that the bark should be treated with a good coat of soft soap well rubbed into the affected parts of the trees.

Yet another boring beetle is given, known as *Hylurgus piniperda*, or pine beetle, injurious more on account of the harm the beetles cause by boring through the side of the tender shoots of young pine trees and eating their way for an inch or more along the pith, than from the galleries made by the larvæ in pine timber. As they often select dead or diseased trees for boring into for breeding purposes, felled trees should be at once removed and diseased branches or limbs of trees in infected woods should be cut off and carried away. Or traps may be set for the beetle by placing "young Scots pine tops, thinning off all the branches (which makes them convenient to handle) in the plantations or against the lower part of the standing trees." The beetles select these for laying their eggs upon, and they should be taken away and burned in June.

Another pine beetle, *Hylobius abietis*, is even more injurious to many of the coniferæ than the *Hylurgus*. It may be entrapped in the same manner, as it frequents forest clearings, that is, where fir trees, few or many, have recently been felled, and lays its eggs also on logs and stumps.

Against the attacks of many other insects troublesome to trees, such as the pine-bud moth, the pine-shoot moth, the pine saw fly, the spruce gall aphis, the larch aphis, the willow beetle, and the oak-tree roller moth, methods of prevention and remedies are prescribed. This part of the "Manual" cannot fail to be most instructive and useful to those in charge of woods and forests.

In Part III., treating of fruit-crops and insects that injure them, twenty-three different insects are fully described, and in all cases practical suggestions are made for preventing their onslaughts upon the fruit crops, and for diminishing the virulence of their attacks. These suggestions are most timely, as during the last few years the fruit crops of almost all descriptions have suffered much from insects. Not only have new kinds of insects arisen, but long-known foes have increased and multiplied to a terribly dangerous extent, so that whole districts have been cleared of fruit. For example, in the spring of each of the last three years hosts of caterpillars of several species have ruined the apple, plum, and damson crops in many parts of Kent, and in other fruit-producing counties.

Among the fruit pests that have recently sprung up are the white woolly scale, *Pulvinaria ribesii*, found last year upon currant bushes to a considerable extent. A figure of a currant twig covered with white cottony, or woolly matter, forming a covering for the eggs and young scales is appended, which conveys a good idea of the "almost overwhelming nature of the infestation and the serious amount of injury caused by it." This attack has been known in France for some time, and is mentioned by Signoret in his "Essai sur les Cochenilles." Miss Ormerod recommends applying limewash to the infested bushes with a brush, "the same process as whitewashing." Where remedies cannot be brought to bear, or fail, "it would be best to cut off and burn the infested branches, or to destroy and burn the infested bushes if it could be done without serious loss, and thus stamp out this newly-observed pest in time."

A fruit-tree boring beetle new in this country, but well known in Germany and America, from whence it was probably imported, was identified by Miss Ormerod in 1889 as the "Shot-borer," *Xyleborus dispar*. This was found in Lord Sudeley's fruit plantations in Gloucestershire, in the stem of a young plum tree into which it had bored and killed the tree. Several trees were killed in the same manner. The great peculiarity in these insects is the disparity in size between the females and males, from which it is termed *dispar*. The female is about the eighth of an inch long, while the male is only about two-thirds of this length. The injury begins by a small hole like a shot-hole being bored in the side of the stem, from which a tunnel is made into the pith, and a branch tunnel running horizontally about half, or two-thirds, round the stem. Other tunnels are made straight up and down. These borings, and the destruction of the pith, soon serve to kill the branch. The only remedy appears to be to cut off and burn the infested limb, and "coating the trees with some wash or mixture, which will not hurt the bark but will prevent the beetle getting in or getting out. One application advised for trial is a thick coat of whitewash with some Paris green in it."

There is a detailed account of the winter moth, that arch enemy of apple, pear, and plum growers; this is particularly valuable, as it gives the latest experience of practical growers with respect to preventive and remedial measures. The most important of these is the careful banding of the trees in the autumn, before October, with grease and offensive compounds, to prevent the females from climbing up, and the use of arsenites (Paris green and London purple) for washing or syringing infested trees. These washes have been proved to be efficacious in America, where they are universally applied for many insect attacks. In this country, however, cultivators have hesitated to use them on account of their poisonous nature. Miss Ormerod plainly shows that they may be employed without danger and with vast benefit to the fruit grower. For plum trees, the proportion is 1 ounce of Paris green to 10 gallons of water, and for apple trees 1 ounce to 20 gallons. Testimony is given from various growers as to the efficacy of this wash, which from henceforth will, it is presumed, be adopted, as it seems to be the only one which will check the ravages of moths injurious to fruit trees. Full details concerning the use of these American remedies for insect attack are given, which must be most serviceable.

Want of space prevents allusion to many other insects described in this part of the work. It can only be said that they are clearly and minutely defined, and all that is known of their habits and of means to avert or to modify their mischief is set forth.

The "Manual" is replete with capital figures of the insects in all stages. Many of these are from drawings executed by Miss Ormerod, and many are the well-known accurate and inimitable designs of Curtis.

TORNADOES.

The Tornado. By H. A. Hazen, Assistant Professor of the United States Signal Office. (New York: Hodges, 1890.)

THIS is a book that will hardly enhance the reputation of its author. Despite his assurance (which of course will not be questioned) that he has endeavoured throughout to be absolutely unprejudiced, its apparent aim is not so much to set before the reader a concise description of tornado phenomena as to controvert the views put forward by Ferrel and others relative to their mechanical and physical constitution, and to substitute for these certain other speculations (we can scarcely call them a theory) which appear to the author to have the merit of greater probability. Prof. Hazen does not, indeed, restrict his condemnation to Ferrel's theory of tornadoes and thunder-storms. As a root-and-branch reformer, he finds himself in opposition to the majority of those who, during the last quarter of a century, have built up the fabric of modern meteorology, for, while he speaks with deference of "the epoch-making experiments of Mayer [*sic*] and Joule," he appears to regard as inapplicable to the movements of the atmosphere those laws of thermodynamics which are based on the results of Joule's labours. Were it the practice of scientific authors, in imitation of romance-writers, to head their chapters with quotations appropriate to the subject-matter, chapter v. of this treatise, more especially, might be fitly introduced with the well-known lines from "Faust":—

> "Ich bin der Geist, der stets verneint!
> Und das mit Recht! denn alles was entsteht
> Ist werth, dass es zu Grunde geht";

substituting, however, "*entstanden*" for the present tense of the verb.

Lest it should be thought that these remarks misrepresent or exaggerate the sweeping character of Prof. Hazen's "objections," we extract one or two passages from the chapter in question. On the generally-accepted view that work is performed by an ascending current of air, in pushing aside the atmosphere into which it expands, and that in saturated air the requisite energy is furnished, in part at least, by the condensation of vapour, he observes (p. 52),

"There is nothing in the science of meteorology, or possibly in any physical science, that has been developed from such a worthless origin as this theory of the liberation of energy on the condensation of moisture";

again (p. 54),

"All the reasoning regarding the diminution of temperature in dry and moist air, as we ascend in the atmosphere, is founded upon purely theoretical considerations. Every experiment, whether in the laboratory or in Nature, has proved that these theories, in their sum and substance, are false";

and again (p. 56),

"I am inclined to think that even Espy, with all his disadvantages, was too well informed to adopt such a doubtful and visionary idea as this of effective work performed in the free upper air."

The familiar lecture experiment illustrative of dynamic cooling, in which a cloud is produced in a receiver containing moist air by partially exhausting it with a few strokes of the air-pump, is interpreted in a novel manner consistently with the above opinions (p. 67):—

"The presence of haze or cloud is no evidence of saturated air, for such cloud has been produced in air having only 2 per cent. of moisture.[1] When air is pumped from the room, it has an enormous number of dust particles in it, and these give the appearance of a fog on sudden expansion."

After these samples of the author's opinions it will be scarcely necessary to notice, in detail, the other numerous

---

[1] Prof. Hazen does not give his authority for this statement, nor does he specify whether the expression is to be understood as 2 per cent. of saturation, or 2 per cent. by weight or volume. If the former, authentication seems desirable; if the latter, the fact is obviously irrelevant.